5.1 Introduction

The XFD staff constantly looks for opportunities for collaboration with others in the synchrotron radiation community. This is consistent with the mission of XFD, and rewards from such interactions have been excellent both for XFD staff and the users.

5.2 Collaborative Research Programs

To optimize the use of the APS for its user community, the XFD staff will conduct collaborative R&D with APS users. For example, in 1991, XFD established a Collaborative Research Program (CRP) with potential users of the APS. In this program, a joint proposal is made by XFD staff members and interested APS users to perform R&D on a topic of general interest to APS users. The projects to be pursued for these collaborations are selected by means of a competitive proposal process. The R&D is conducted jointly, with personnel and resources provided by the proposing institution or CAT and the XFD.

Such CRPs were very popular when the process was first introduced. The success stories from these collaborative interactions are many. A couple examples are given here. One of the programs proposed by Sol Gruner of Princeton involved development of pixel array detectors. This program has now matured, and Gruner was awarded $1.38 M by DOE to continue the extension of the CRP. Similarly, Mihai Popovici of the University of Missouri carried out a CRP with XFD staff on the development of bent crystals for focusing monochromators. Popovici has now proposed to extend this work with a DOE grant of $0.45M.

During the past three years, APS users have been very busy in the construction and commissioning of their beamlines at the APS and have not proposed any new CRPs. New calls for CRPs will be issued during the summer of 1997.

5.3 Special Grants for New Collaborative Research

The staff in XFD has also been very successful in obtaining research support for proposals jointly submitted with the APS users. Two recent awards are outlined below.

1. A DOE Grand Challenge Grant given to XFD staff for joint work with researchers from the Mathematical and Computer Science Division of ANL, CARS, and SBC. The subject of this work is: Supercomputer Solution of Massive Crystallographic and Micro-tomographic Structural Problems.

   The work proposed supports the XFD mission and is also relevant to DOE. The tomographic reconstruction supports work of the DOE Divisions of Engineering and Geosciences and Material Science. The work on direct phase solution of crystallographic structure is of primary interest to the Office of Health and Environmental Research.

   Work on computational infrastructure will produce new techniques for coupling supercomputers with advanced instruments over high speed local and wide area networks, for remote visualization and monitoring results, for large-scale optimization, and for managing and visualizing very

large data sets. These capabilities are an important step in the use of computer power and networks and should have a broad impact on all APS users.

2. An award given to the staff of the Oriental Institute at The University of Chicago and XFD staff by the Joint Research Support Program of The University Chicago and ANL. The work will lead to the first applications of synchrotron radiation in the field of archaeometallurgy. This collaboration will facilitate interactions between x-ray experimentalists from XFD and archaeologists from the Oriental Institute, The University of Chicago, in a way that will accelerate the rate of transfer of modern x-ray techniques to a new field.

   The effort is also expected to facilitate the training of graduate students from archaeology in modern x-ray techniques.

5.4 Collaborative Projects with Other Synchrotron Radiation Facilities

The XFD staff is often requested to support work in the design and fabrication of major instrumentation for various other synchrotron radiation facilities. Such work is performed either in collaboration or through a full cost recovery plan. Some examples follow:

a. Construction and commissioning of an elliptical multipole wiggler at the NSLS X-ray Ring was performed in collaboration with the Brookhaven National Laboratory staff. This source of circularly polarized radiation with switchable helicity is now used at the NSLS by the users.

b. Tuning of the APS-CHESS prototype undulator to meet the stringent magnetic tolerances of a microwave FEL being developed at NSLS.

c. Design and construction of undulator vacuum chambers for BESSY II. The cost of this work was fully recovered from BESSY.

d. Design and construction of prototypes of photon masks and photon shutters for four undulator beamlines at SPring-8. This continuing work is fully paid for by SPring-8.

e. There have been four joint APS-ESRF-SPring-8 workshops during the past four years. These workshops are primarily for the facility staff of all three institutions to exchange their experience both in the accelerator and experimental areas. These workshops have had great value in sharing information and performing joint experiments. For example, in XFD, much of the early work on high heat load optics was carried out jointly at ESRF beamlines by scientists from the three facilities. Design and construction of small-aperture undulator vacuum chambers and x-ray beam position monitors for the undulator beamline front end were also performed at the ESRF beamline. This joint collaboration between APS, ESRF and SPring-8 is expected to continue in future years.

The success of the above projects is a true testimonial to the world-wide recognition of XFD staff. (See Appendix 9 for a list of invited talks.)